SOLVING QUADACTIC –LINEAR SYSTEMS ALGEBRAICALLY

Answer

Two equations will be given to you with the directions to solve the system algebraically

- One equation will be a quadratic.
- The second equation will be linear.

• Lets Recap! •

Systems of Linear Equations → there were 3 ways to solve:

1. Sub
2. Elim
3. Graphing

With Quadratics:

- Substitute - to find first variable, then sub that value in to find second or Graph or Elimination ↓ will still need to solve

Examples:

1. Solve the following system: $y = x^2 - x + 2$, $y = 2x$

graph

$2x = x^2 - x + 2$

$0 = x^2 - 3x + 2$

$x - 2 = 0 \quad x - 1 = 0$

$x = 2 \quad x = 1$

(2, 4) (1, 2)

2. Find the solutions of: $y = -x^2 + 4x - 3$, $x + y = 1$

$y = 1 - x$

$1 - x = -x^2 + 4x - 3$

$0 = -x^2 + 5x - 4$

$-(x^2 - 5x + 4)$

4, −4, −1, −5

$x - 4 = 0 \quad x - 1 = 0$

$x = 4 \quad x = 1$

$y = -3 \quad y = 0$

graph

3. Solve for the solutions: $y = x^2 - 7x + 13$, $x - y = 2$

Graph

$-y = 2 - x$

$y = -2 + x$

$x = 2 + y$

$-2 + x = x^2 - 7x + 13$ OR

$0 = x^2 - 8x + 15$

15, −3, −5, −8

$x = 3 \quad x = 5$

$y = (2+y)^2 - 7(2+y) + 13$

$y = (2+y)(2+y) - 14 - 7y + 13$

$y = 4 + 4y + y^2 - 14 - 7y + 13$

$y = y^2 - 3y + 3$

$0 = y^2 - 4y + 3$

3, −3, −1, −4

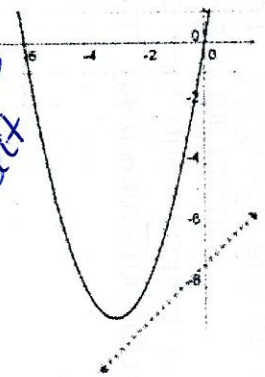
$y - 3 = 0 \quad y - 1 = 0$

$y = 3 \quad y = 1$

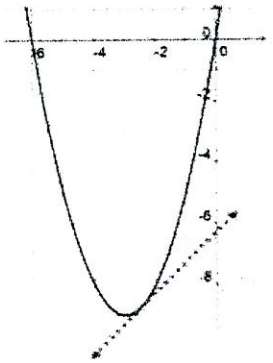
$x = 5 \quad x = 3$

A linear-quadratic System will have no solution, one solution, or two solutions.

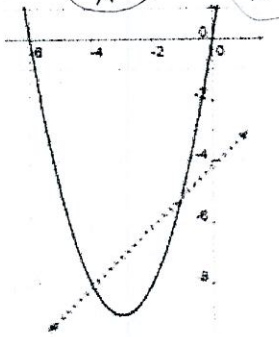
2nd → calc → intersect



No Solution



One Solution (tangent line) "just touches"



Two Solutions (secant line) "goes 2 points"

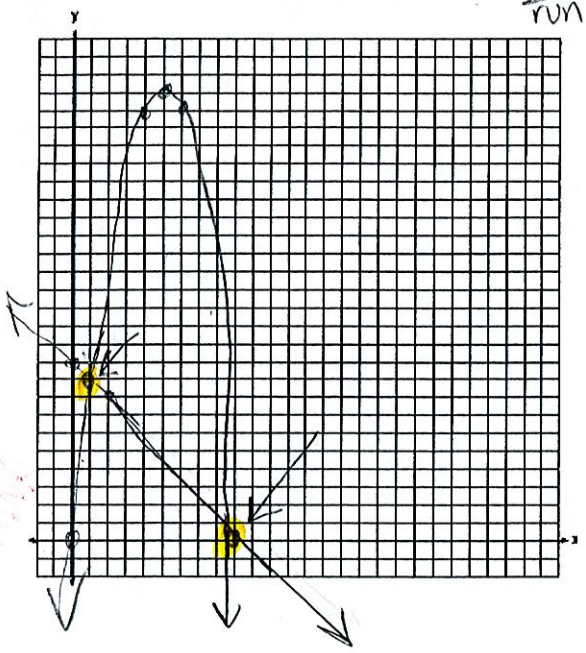
Quadratic-linear Systems Word Problems

$-b/2a = -10/2(-1) = -10/-2 = 5$

$-(5)^2 + 10(5)$
$-25 + 50$
25 (5, 25)

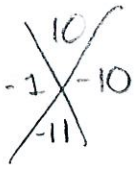
1. A rocket is launched from the ground and follows a parabolic path represented by the equation $y = -x^2 + 10x$. At the same time, a flare is launched from a height of 10 feet and follows a straight path represented by the equation $y = -x + 10$. Using the accompanying set of axes, graph the equations that represent the paths of the rocket and the flare, and find the coordinates of the point or points where the paths intersect.

rise/run start



$-x^2 + 10x = -x + 10$

$0 = x^2 - 11x + 10$



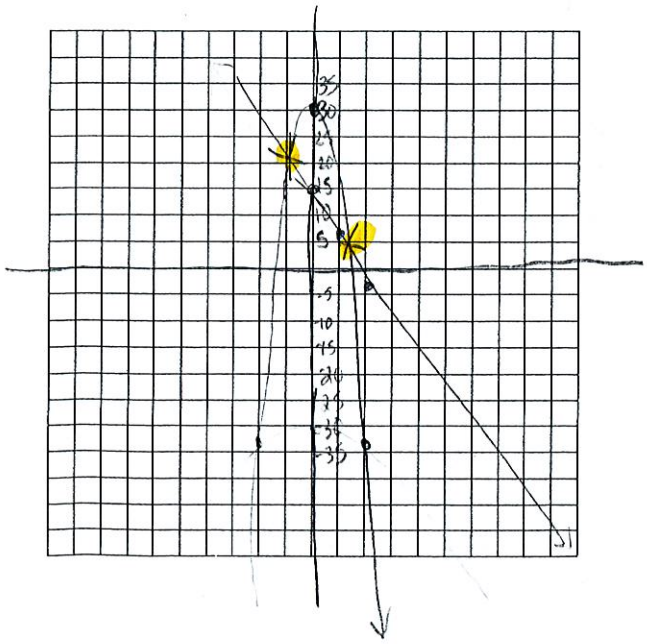
$x - 1 = 0 \quad x - 10 = 0$

$x = 1 \quad x = 10$

(1, 9) (10, 0)

[1]

2. A pelican flying in the air over water drops a crab from a height of 30 feet. The distance the crab is from the water as it falls can be represented by the function $h(t) = -16t^2 + 30$, where t is time, in seconds. To catch the crab as it falls, a gull flies along a path represented by the function $g(t) = -8t + 15$. Can the gull catch the crab before the crab hits the water? Justify your answer. [The use of the accompanying grid is optional.]



x	y
-2	-34
0	30
2	-34

yes, the gull can catch the crab at 1.25 sec, 5 ft above water

$-16t^2 + 30 = -8t + 15$

$-16t^2 + 8t + 15 = 0$

$\frac{-8 \pm \sqrt{8^2 - 4(-16)(15)}}{2(-16)} = \frac{-8 \pm \sqrt{64 + 960}}{-32}$

[2] $\frac{-8+32}{-32}$ $\frac{-8-32}{-32}$

$= -.75, 2$ | $= 1.25, 5$